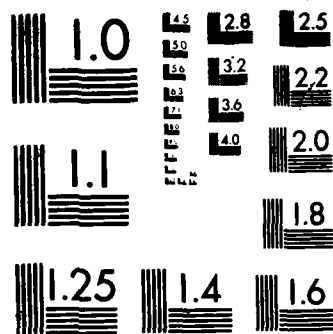


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KNOWLEDGE DELIVERY RESEARCH:  
PROJECT STATUS AND HISTORY

William C. Mann  
USC/ISI

May 29, 1986

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>Substantially all of the initial goals of this project have been accomplished: design of overall program structures; creation of a computational grammar of english; and creation of an explicit theory of discourse structure. Components pf tje next phase consist of a focus on knowledge representation and notation; creation of text-planning techniques based on a newly developed descriptive theory of text organization; and an emphasis on validation of the work through experimental applications. this research project probably represents the best knowledge delivery research project in the country.

# Knowledge Delivery Research: Project Status and History

William C. Mann  
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## 1 Origins of the Present Knowledge Delivery Research Project

AFOSR Knowledge Delivery Research started in the summer of 1980.<sup>1</sup> The major goals of the first five-year phase were:

1. Designing an overall program structure in which grammar, programmed knowledge of discourse, and other components can be appropriately related and controlled.
2. Creating a computational grammar of English for text generation that is transferable from one research group and purpose to another.
3. Creating an explicit theory of discourse structure, suitable as a basis for computer program implementation.

In 1984 these goals had been substantially accomplished, and so attention turned to more ambitious goals of knowledge delivery. In early 1985 new research directions were chosen. The technological situation was seen as the following:

1. Computational application of Systemic Functional Grammar to text generation was well formulated and well elaborated.
2. Descriptive theory of text organization was in an interesting and informative state in which its promise was evident but more refinement was needed.
3. Constructive theory of text organization -- actual organization methods -- was in a formative state.
4. There was a strong need for experimental applications of recently developed theory -- to test both integrity and coverage, and to see whether there were serious unaddressed problems limiting the quality of generated text.

The principal components of the new program were:

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<sup>1</sup>The work arose from an earlier NSF sponsored project which created a text generation system, called KDS, which wrote instructional paragraphs about what to do in case of fire in a computer room [Mann & Moore 80, Mann & Moore 81].

1. A focus on knowledge representation and notation;
2. Creation of text-planning techniques based on a newly developed descriptive theory of text organization;
3. An emphasis on validation of the work through experimental applications.

Shortly after this program was proposed, DARPA<sup>2</sup> appealed for proposals of state-of-the-art applications of natural language processing technology.<sup>3</sup> They conducted a competition among proposers, finally choosing 7 investigators, mostly university-based. Only 2 groups were chosen to work on the "next generation natural language interface," ISI and BBN<sup>4</sup>, and of these, only one group was supported to work entirely on generation: ISI.

DARPA's plan calls for peer cooperation between ISI and BBN, in which a new military database access system is designed using state-of-the-art natural language processing technologies for both understanding of English input and generation of English output. This system, eventually to be called Janus, is the first research system to combine linguistically sophisticated understanding and generation technologies in a single interface.

ISI has chosen to manage the AFOSR Knowledge Delivery Research and the DARPA text generation work as a single project pursuing multiple goals. There are several decisive reasons to prefer this arrangement:

1. The Knowledge Delivery project had already a recognized need to create an experimental application very soon.
2. The effort of creating the application would be mostly supported by DARPA, while the fundamental research portion would be mostly supported by AFOSR.
3. There would be a guarantee that available knowledge delivery ideas would be tested.
4. Existing models and code from previous and concurrent DARPA research, (including some undocumented models and code), could be utilized with the shared team.
5. A wide range of computational and linguistic skills was needed and could be provided better by the larger team.

<sup>2</sup>Defense Advanced Research Projects Agency

<sup>3</sup>The program is part of the Strategic Computing Initiative.

<sup>4</sup>Bolt, Beranek and Newman, Inc., Cambridge, MA.



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6. The visibility and leadership quality of DARPA's program were expected to reflect well on AFOSR.
7. The joint program would disseminate the results of the AFOSR research to a much broader research community.

## 2 Current Research Issues and Goals

The current research is focused on the following issues and developments:

1. How can the knowledge of actions and their participants be represented in a useful and consistent way?
2. How can the knowledge of time and events be represented in a useful and consistent way?
3. How can the knowledge of relationships between propositions be represented in a useful and consistent way?
4. How can texts be planned and organized in a way that makes them well written?
5. How can new methods for knowledge delivery be tested, refined, demonstrated and applied experimentally?

ISI's research proposal of January 1985 set these out as the principal initial topics for the four years beginning in August 1985. The renewal proposal of February 1986 gives a more current view; the topics are retained, and more detail is provided based on intervening progress.

## 3 Interactions with DARPA-sponsored Research

The Knowledge Delivery Research Project has been substantially aided by interaction with DARPA-sponsored Janus system development. The DARPA project has also been aided, and in fact could not have been created without the ideas and programs developed under DARPA support. Janus serves as a testbed and a medium of refinement of Knowledge Delivery ideas. Knowledge Delivery serves as an idea source for system design and allows the freedom to develop more basic and precomputational ideas which benefit system design only after refinement.

## **4 Goals for Future Years**

We intend to continue a program of innovative, state-of-the-art research in text generation and knowledge delivery. The research strategy of function re-representation has only begun to assimilate the functionality of English in to computer programs. We intend to continue to develop new computational capabilities based on natural-language models.

Some of this work will fit well into DARPA-supported system development, and some will probably not. Where the territory is unexplored and the results too unpredictable for the design of demonstration systems, the two projects will work independently.



## References

[Mann & Moore 80] Mann, W. C., and J. A. Moore, *Computer as Author--Results and Prospects*, USC/Information Sciences Institute, RR-79-82, 1980.

[Mann & Moore 81] Mann, W. C., and J. A. Moore, "Computer generation of multiparagraph English text," *American Journal of Computational Linguistics* 7, (1), January - March 1981.

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